

Appl. No. 10/726,171
Amdt. dated February 24, 2006
Reply to Office Action of September 26, 2005

REMARKS / ARGUMENTS

Summary of the Present Invention

The present invention is a catalyst for use in the water-gas-shift reaction. The catalyst comprises platinum, rhenium and lanthanum on an anatase titanium dioxide containing carrier doped with lanthanum oxide. The total weight percent of the active metals – platinum and rhenium – is about 20 wt%. The platinum and rhenium preferably have a relative weight ratio of from about 1 Pt : 0.9 Re to about 5 Pt : 1 Re. The lanthanum is preferably present at a concentration of up to about 20 wt%. Optionally, cerium, zirconium, tungsten or a combination thereof may be added to the carrier to improve the stability of the catalyst. The catalyst of the present invention is more resistant to CO poisoning and more stable than the prior art catalysts.

Remarks Regarding Double Patenting and Claims Objections

The Examiner has provisionally rejected Claims 1 – 19 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 – 19 of copending Application Number 10/726,147. Concurrent with the filing of this Amendment, Applicant is filing a terminal disclaimer with the Commissioner of Patents, a copy of which is attached.

The Examiner objected to Claims 2 – 3, 7, 10 – 11, 15 – 16 and 18 because of informalities. These Claims have been amended to read as proposed by the Examiner. It is Applicant's belief that these amendments are grammatical in nature and do not add new matter to the Claims.

Claim 11 has been amended to correct an incorrectly designated claim from which it is depended.

Claims 1 – 19 remain in the application. Claims 2 – 8 depend from independent Claim 1, Claims 10 – 15 depend from independent Claim 9, and Claims 15 – 19 depend from independent Claim 14.

Remarks Regarding Claims Rejected Under 35 USC §103(a)

The Examiner has rejected Claims 1 – 6 and 9 – 17 under 35 U.S.C §103(a) as obvious in view of Komatsu et al (U.S. Patent 6,121,191, "the '191 patent") taken together with Eri et al (U.S. Patent 4,801,573, "the '573 patent"). The Examiner has rejected Claims 7 – 8 and 18 – 19 under 35 U.S.C §103(a) as obvious in view of Komatsu et al (U.S. Patent 6,121,191, "the '191 patent") taken together with Tang et al (U.S. Patent 6,019,954, "the '954 patent").

The '191 patent teaches and claims a photocatalyst supporting ultra-fine (nanometer diameter) metal particles selected from the group consisting of platinum, gold, palladium, rhodium, ruthenium and silver, supported on a rutile type titanium dioxide. The photocatalyst is intended for use in the decomposition of environmental organic matter (see column 24, line 65 to column 25, line 4).

Appl. No. 10/726,171
Amdt. dated February 24, 2006
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The '573 patent teaches and claims a catalyst for converting synthesis gas to hydrocarbons comprising cobalt and rhenium on an alumina support. Optionally, lanthanum may be added as a promoter.

The '954 patent teaches and claims a process for a water gas shift reaction using a catalyst comprising Co, Ni, Mo and/or W active components on a TiO_2 / MgO / Al_2O_3 support.

The Examiner contends that "[i]t would have been *prima facie obvious* to one of ordinary skill in the art at the time the invention was made to have incorporated rhenium and lanthanum into the catalyst of Komatsu in order to achieve a promoted catalyst, which promotes the production of products with higher boiling points while maintaining or improving catalytic activity, because it is known to use rhenium to make catalysts and lanthanum is recognized as a useful catalyst promoter among other catalyst promoters, as evidenced by Eri..."

First, Applicant submits that there is no relationship between the reactions being catalyzed in either the '191 patent (photocatalysis of environmental contaminants) or in the '573 patent (conversion of synthesis gas to hydrocarbons) with the reaction being catalyzed in the present application (water gas shift). In each of these cited references, hydrocarbon compounds are either being decomposed (the '191 patent) or synthesized (the '573 patent). In the present application, as in the '954 patent, no hydrocarbons are being synthesized or decomposed, rather the reaction being catalyzed is the transfer of an oxygen molecule between water and carbon monoxide, referred to as a water gas shift reaction.

Second, Applicant agrees with the Examiner that the '191 patent does not teach or suggest the use of rhenium or lanthanum or cerium (or any of the additives taught in the '954 patent) in combination with the platinum. Applicant further notes that the '573 patent does not teach or suggest that cobalt can be eliminated from the '573 catalyst, nor does the '573 patent teach or suggest that platinum could be used in place of cobalt to achieve the desired conversion of synthesis gas to hydrocarbons, nor that the catalyst support may be an anatase titanium dioxide instead of alumina. Applicant also notes that the '954 patent does not teach or suggest the use of platinum, rhenium, lanthanum or anatase titanium dioxide for use in a water gas shift catalyst.

Third, Applicant contends that the Examiner has failed to establish a *prima facie* case of obviousness with respect to combining the '191 patent and the '573 patent, and with respect to combining the '191 patent and the '954 patent. According to MPEP §706.02(j), "three basic criteria must be met [to establish a *prima facie* case of obviousness]. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the

Appl. No. 10/726,171
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claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)."

Applicant contends that there is no suggestion or motivation in the '191 patent to include the rhenium and / or lanthanum taught in the '573 patent in the catalyst of the '191 patent, and particularly no teaching or suggestion to include the lanthanum in the support of the catalyst of the '191 patent. Nor is there any suggestion or motivation in the '573 patent to include the platinum taught in the '191 patent in the catalyst of the '573 patent. Further, there is no suggestion or motivation in the knowledge generally available to one of ordinary skill in the art, to modify these references or to combine reference teachings. The argument that the Examiner sets forth – that "it is known to use rhenium to make catalysts and lanthanum is recognized as a useful catalyst promoter ..." – merely shows that these elements have been used in catalysts, not that either or both have been combined with platinum on an anatase titanium dioxide to make a water gas shift catalyst, nor is there any showing that lanthanum has been used to dope an anatase titanium dioxide support to make a water gas shift catalyst. Thus, the combination of the present invention – platinum and rhenium on a lanthanum-doped anatase titanium dioxide support – is distinguishable and non-obvious in view of the '191 patent and the '573 patent, taken alone or in combination.

There is also no suggestion or motivation in the '191 patent to include the cerium taught in the '954 patent in the catalyst of the '191 patent, nor is there any suggestion or motivation in the '954 patent to include the platinum taught in the '191 patent in the catalyst of the '954 patent. Further, there is no suggestion or motivation in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. The argument that the Examiner sets forth – that "molybdenum and rare earth metals including cerium are known catalyst promoters ..." – merely shows that these elements have been used in catalysts, not that any have been combined with platinum on a lanthanum-doped anatase titanium dioxide support to make a water gas shift catalyst. Thus, the combination of the present invention – platinum and rhenium on a lanthanum-doped anatase titanium dioxide support – is distinguishable and non-obvious in view of the '191 patent and the '954 patent, taken alone or in combination.

Applicant further contends that there is no reasonable expectation of success by combining the '191 and '573 references. In fact, the Examiner sets forth the reason why this combination would not be expected to be successful: incorporating rhenium and lanthanum into the catalyst of Komatsu would be expected "to achieve a promoted catalyst, which promotes the production of products with higher boiling points". But the entire purpose of the photocatalyst of Komatsu is to decompose environmental

Appl. No. 10/726,171
Amdt. dated February 24, 2006
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contaminants, and the photocatalyst of the '191 patent is touted for its decomposition effectiveness: "The photocatalytic characteristics of photocatalysts supporting ultra-fine metal particles, *i.e.*, the characteristics of such catalysts in terms of organic matter decomposing power, are far superior to those of photocatalysts supporting micron-sized metal particles or simple photocatalysts supporting no metal particles." (See column 24, line 65 to column 25, line 4.) As is known by one of ordinary skill in the art, the boiling points of hydrocarbons generally increase as the molecular weight of the hydrocarbons increase. But decomposition would be expected to reduce the molecular weight of the environmental hydrocarbons, thereby resulting in decreased boiling points. In other words, the addition of rhenium and lanthanum contradicts the reason for preparing an ultra-fine metal particle photocatalyst on rutile titanium dioxide.

There is also no reasonable expectation of success by combining the '191 and '954 references. This combination alone would lack the rhenium and lanthanum required in the independent claims of the present application. Without these elements, it is not apparent why a catalyst intended for hydrocarbon decomposition would, by the addition of cerium in the absence of the other well-known water-gas-shift catalysts (namely cobalt, nickel, molybdenum and tungsten), suddenly be an effective water gas shift catalyst.

Applicant also contends that the prior art references when combined do not teach or suggest all the claim limitations of the independent claims of the present application. Although within the combined texts of the '191 patent and the '573 patent the terms "platinum," "rhenium," "lanthanum" and "anatase titanium dioxide" can be found, all the claim limitations of the independent claims of the present application are not taught or suggested because based on the teachings of the '191 patent and the '573 patent, one skilled in the art would not combine platinum with rhenium, either with or without lanthanum, on a anatase titanium dioxide support and expect to develop a catalyst that promotes the water gas shift reaction. But it is the combination of these four elements that is required by independent Claims 1, 9 and 14 of the present application.

The combination of the '191 patent and the '954 patent fail to even set forth in general discussion terms all the claim limitations of the independent claims of the present application. In particular, rhenium and lanthanum are lacking from the combination.

Thus, independent Claim 1 and its dependent Claims 2 – 8, independent Claim 9 and its dependent Claims 10 – 13, and independent Claim 14 and its dependent Claims 15 – 19, are not obvious in view of U.S. Patent 6,121,191 or U.S. Patent 4,801,573 or U.S. Patent 6,019,954, with each taken alone or taken in combination.

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Remarks Regarding Information Disclosure Statement

Applicant acknowledges the Examiner's comments regarding inclusion of U.S. Publication Numbers on PTO-1449. Applicant submits herewith a copy of the supplemental PTO-1449 that is being filed with the U.S. PTO concurrent with this Amendment citing the disclosed references by their U.S. patent application serial numbers rather than their U.S. publication numbers.

Remarks Regarding Allowable Subject Matter

The Examiner has not indicated that there is any allowable subject matter at this time.

Remarks Regarding Citations

Applicant has made note of the prior art recited by the Examiner in the Notice of References Cited.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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